The Computer Creators

Mike James charts the history of the Altair – the very first home computer

As well as important people, there are also some important machines in the history of computing. Some are linked so closely with a single person that their stories are one and the same. However, there are a very small number of machines whose creation are part of a larger story than one person's contribution. So it is with the Altair, the first personal computer, which sparked the revolution that is still with us today.

File card: Altair

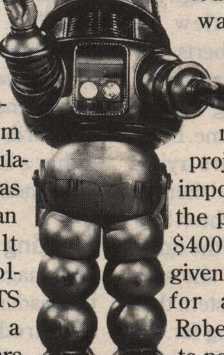
Name: Altair
Born: 1975
Country: USA
Specialism: Early personal computing
Theories: S100 bus
Products: The personal computer industry
Companies: MITS

IN THE EARLY 1970S, COMPUTING had reached a point in its development where a large number of people had been exposed to its power and potential but had also been dismayed to discover how much it cost. The simple truth was that while it was possible to allow university students and even school pupils to have access to a computer, the time allocation was always rationed. Following an educational experience of computing, the afterlife was usually bleak. With minicomputers costing £50,000, and mainframe timeshare bills threatening to reach as much, in a short time there was a growing population of frustrated would-be computer users.

Of course, in the United States the situation was a little better in the sense that educational computer access was easier; but it was also worse in that even more people discovered that they had a use for a computer at home – if only they were cheap enough. In 1970 Intel had produced the first microprocessor, but it was a highly specialised and expensive component. To use a microprocessor you needed a hardware development system that cost almost as much as a minicomputer. Indeed, most of the software intended to run on the microprocessor of the time was developed using cross compilers. In short, microprocessors were no solution to the computer famine because they were expensive and bore little resemblance to their big brothers.

Still, people could dream. The introduction of the integrated circuit had altered electronics as a profession and a hobby. Enthusiasts who had worked hard to build a single-transistor radio set could now build complex circuits involving tens and even hundreds of transistors. Many had dreamed of building a computer – the ultimate electronic product – but they were still thwarted by the large number of discrete circuits needed for even the simplest computer. So the craving grew unsatisfied.

In the USA things were bound to happen first. Gurus like Ted Nelson were talking about the advantages of personal computing but still nothing happened. Ed Roberts was an enthusiast. He became enthusiastic about almost anything that he got a little interested in – bee-keeping, photography. In particular he loved electronics. He even went so far as to join the Air Force to learn something about the subject. He was posted to a base just outside Albuquerque in New Mexico. There he formed a company; Model Instrumentation and Telemetry Systems, MITS for short. MITS designed, made and sold radio-controlled models and even model rockets by mail order. The company was run from a garage, but in 1968 Roberts moved it into a former restaurant called 'The Enchanted Sandwich Shop' and started to build calculator kits. At the time, pocket calculators were a growth industry and MITS was the first company in the USA to offer calculator kits. The company grew to employ over 100 people. However, the bottom soon fell out of the calculator market because Texas Instruments introduced an affordable, ready-built model. A price war followed, and by 1974 MITS found itself more than a quarter of a million dollars in the red.



Ed Roberts decided that a change was needed and set out to build a computer kit based on the new Intel 8080 chip. There were already a small number of computer kits available, and the personal computer industry was very definitely trying to get off the ground. Scelbi Computer Consultants had already introduced what was possibly the very first computer kit – the 8-H – but it was based on the underpowered 8008 microprocessor and was more like an advanced controller than a computer.

Roberts, however, wanted to go for something more like a real computer, and based his design on the then new Intel 8080. The 8080 was an 8-bit device and the start of the family of Intel processors that led up to today's 386/486/Pentium range. Even so, by today's standards the chip was fairly feeble – 64K addressing and a very limited instruction set.

The design of the machine wasn't an easy project, but perhaps the most important decision was that the price would be less than $400. This was a bold step given that the 8080 was selling for around $350 apiece. Roberts managed, somehow, to persuade Intel to part with the chips for $75 each! ➧

Altair photography: Ian McKinnell Robbie pic: Kobal Collection

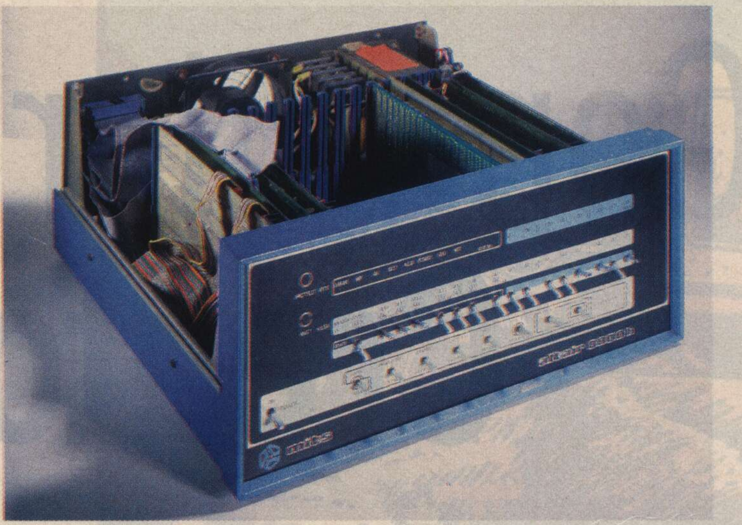
On the boil

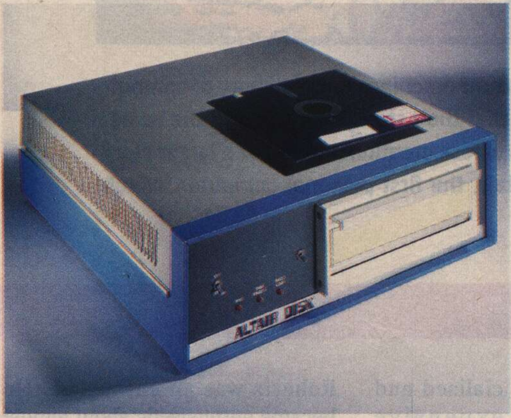
The hardware design that Roberts and his team of engineers finally came up with set the standard for the explosive developments that were to follow. Much of the design was cooked up via phone conversations with his old schoolfriend Eddie Curry. Later Curry would become executive vice president.

Rather than attempt to build the whole thing on one printed circuit board, MITS used a modular design. The CPU was assembled on one card, the memory on another and the interface on yet another. The whole lot was connected together by a motherboard with four sockets. The bus that Ed Roberts introduced would become famous as the S100 bus, although it was little more than the basic control signals of the 8080 processor supplemented by a few necessary extras and 50 earth connections – making the total of 100 connections that gave the bus its name.

The case that the electronics were packed into was just a rectangular box, but it did have the necessary array of flashing LEDs and key switches! At that time the popular conception of a computer involved banks of flashing lights and switches, but the need for them in this case was far from cosmetic. The problem was that there were no suitable I/O devices for this early personal computer. The only way that it could be programmed was via the switches. You had to key in the binary code of each instruction in turn and when you ran your program the output was via the pattern of LEDs on the front panel. It's difficult to believe that keyboards and video displays were just too expensive – but they were.

The next stage in the development of the machine could have been the most important of all. Les Solomon, the editor of *Popular Electronics* magazine, had been on the lookout for a computer project for some time and heard rumours of Ed Roberts' plan. This sounded like a project that was good enough for the cover! Solomon flew to Albuquerque to talk to Roberts and arranged for it to feature in the January issue – as long as the design was completed in time. Back in New York he spent hours trying to think up a good name and then he asked his 12-year-old daughter. She was watching *Star Trek* at the time, then a new series, and so she suggested Altair – the star system that the Enterprise was heading for. As Roberts was a sci-fi fan he liked the name because it was also the planet in the classic sci-fi film *Forbidden Planet* (the one with Robbie the Robot in it!) Thus the new machine was christened the Altair 8800.





There aren't many Altair 8800s left – the nearest we could track down was a 680b (above). The Altair disk drive (left) was a late addition to the range; to give you an idea how chunky this piece of kit was, that's an 8" disk lying on top...

The first prototype was completed in time for the January issue of *Popular Electronics* and Roberts packed it up and shipped it off to New York. It didn't arrive. The first personal computer, a term coined by Roberts, was lost in the post! Les Solomon, like any good magazine editor, was in a panic. Without the time available to build a second prototype, the photograph on the cover of the magazine had to be an empty metal case. The machine that the article described was feeble to say the least. The memory consisted of 256 bytes, and this was probably all that could be used given that programs had to be loaded by setting switches. To tantalise the reader the promise of adding more memory via expansion cards to a 'massive' 4K was made – at the time the memory cards didn't exist and it took rather a long time for MITS to produce them.

Meeting demand

The magazine article did capture the readers' imagination. The day it appeared Roberts received five phone calls, the next day nine, and by the end of the week the average was 25 per day. Very soon the company which had been so close to failure was worth a quarter of a million dollars and was growing. Again it is difficult to imagine what all those people were doing with such a limited computer but it lit the fire. Computer homebrew clubs sprang up all over the country, but particularly in California. MITS, even with its name changed to Micro Instrumentation Telemetry Systems, was quite unprepared for the success. They simply couldn't meet the frantic demand. Customers often waited more than the 60 day delivery promise. Some customers even camped outside waiting for their machine. The demand, and MITS inability to meet it, soon brought the clone manufactures on the scene. Yes, even the first personal computer was cloned, with firms such as IMSI and Cromemco making 8080 and later Z80 clones of the Altair. Other companies, notably South West Technical Products, produced alternative products based on the 6800 processor. But the inspiration still came from MITS and the Altair.

Perhaps the most profound effect of the Altair was on the young Paul Allen, a lifelong reader of *Popular Computing*, and his friend Bill Gates. Allen saw the cover showing the mocked-up Altair and rushed to show Gates. They both decided that the time had come and planned to write a version of Basic for it. The rest is history! Roberts and MITS people in general were not at all sure that their machine was up to running Basic, and anyway to do it properly it needed a serial interface and an ASR33 Teletype for I/O. Gates and Allen wrote their Basic interpreter using an Altair simulator on a PDP minicomputer. When Paul Allen tried it out for the first time on the real thing it worked, and he and the MITS people were amazed to see their machine do something real – even if it was only adding 2 and 2. Roberts offered Allen and Gates a job and a contract. The availability of a real language made the Altair even more attractive, and while Allen and Gates used the Altair to sell their Basic, the truth is more likely that their Basic sold the Altair.

Gates and Roberts argued about almost everything. Roberts thought that Gates was too smart for his own good and personalities clashed. MITS was run as a chaotic organisation and Gates didn't like it much. The memory expansion boards that were needed to run his Microsoft Basic rarely worked, and the other hardware advances were well behind schedule.

MITS meanwhile started work on a new machine, the Altair 680b – a 6800-based version. It wasn't a great success. As time went by, MITS found an increasing slice of the market was being taken by startup companies. Roberts became increasingly difficult to deal with, and claimed Microsoft Basic was in fact MITS Basic. He decided to sell MITS, and saw the Basic licence as the most valuable part of the property. In 1977 he sold MITS to Pertec, a disk drive manufacturer, for several million dollars of stock. Pertec's loss of the Basic licence back to Microsoft laid the foundation for the software industry.

Ed Roberts retired to a farm, which he sold a few years later to train as a family doctor. Today he practices in a small town in Georgia, where few know of his part in the birth of the personal computer revolution. The Altair was, in its time, a machine as important as the IBM PC, since it gave rise to the first generation of personal computers, the S100 machines. A star indeed. ■

Thanks to the Science Museum, London (who would be very interested to hear of any surviving Altair 8800s – write via Shopper), the Computer Preservation Society, and Mr Trevor Jones for their help in tracking down Altair hardware for this article.